

# US DOE Clean Energy - Efficiency and Renewable Investments



U.S. DEPARTMENT OF  
**ENERGY**



**APEC Expert Group on Energy  
Efficiency and Conservation**

Washington 28 Feb – 2 March 2011

P Marc LaFrance  
EERE - Building Technologies  
US EGEEC Rep

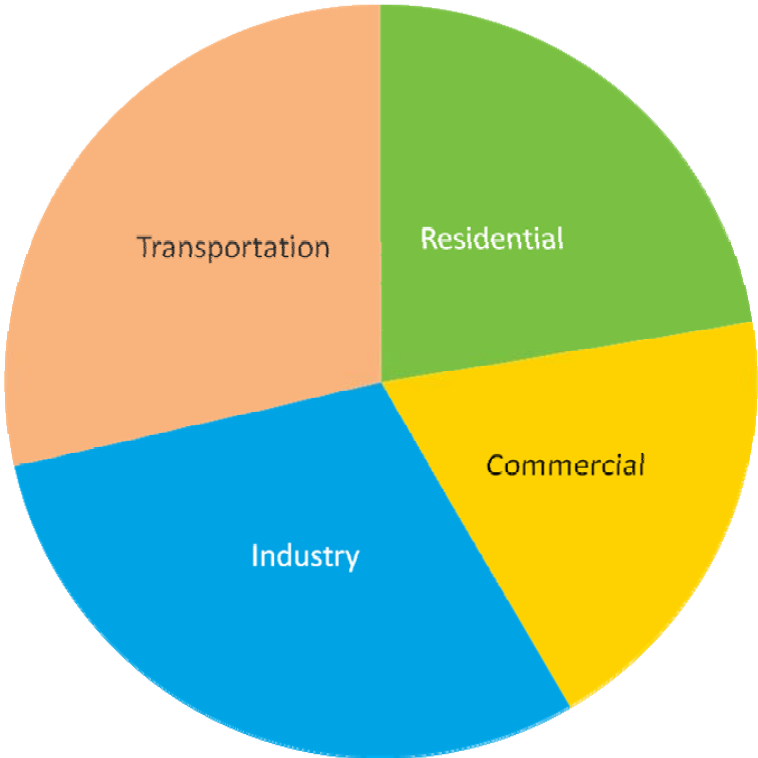


“This is our generation’s Sputnik moment. We’ll invest in ... clean energy technology — an investment that will strengthen our security, protect our planet, and create countless new jobs for our people. Maintaining our leadership in research and technology is crucial to America’s success.”

President Obama  
State of the Union  
January 25, 2011

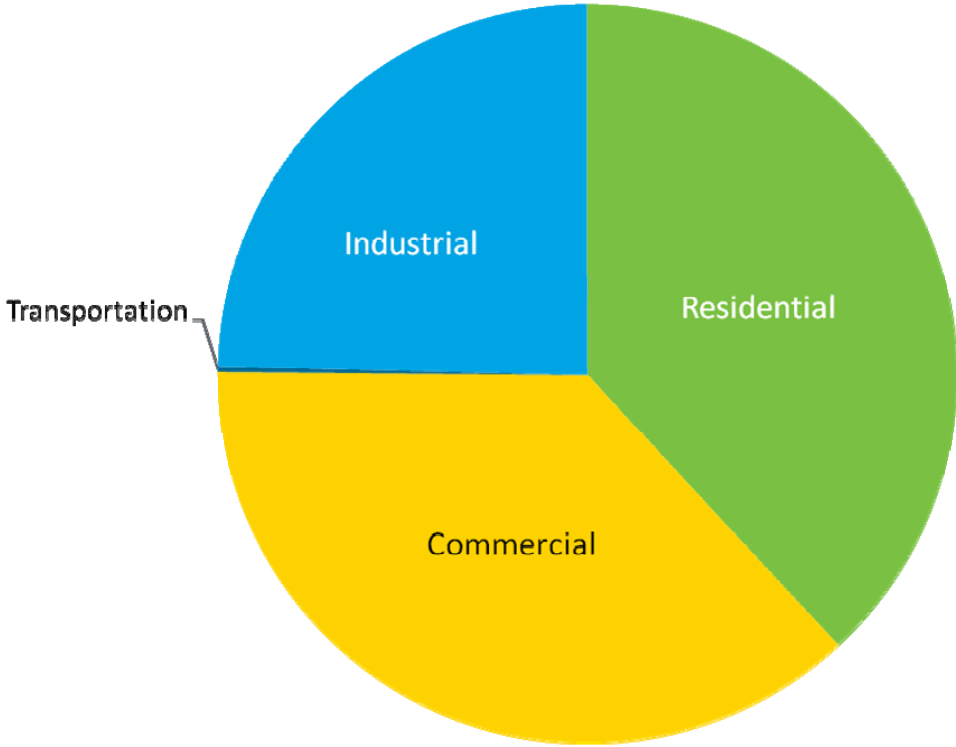
# U.S. Energy Demand in 2009

**Primary Energy Use by Sector**



Total: 94.5 Quadrillion BTU

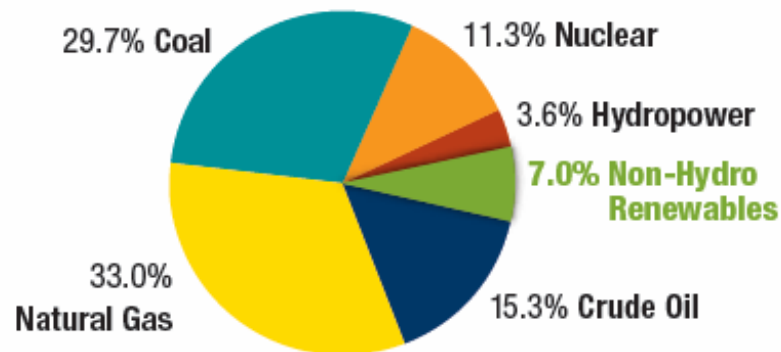
**Electricity Use by Sector**



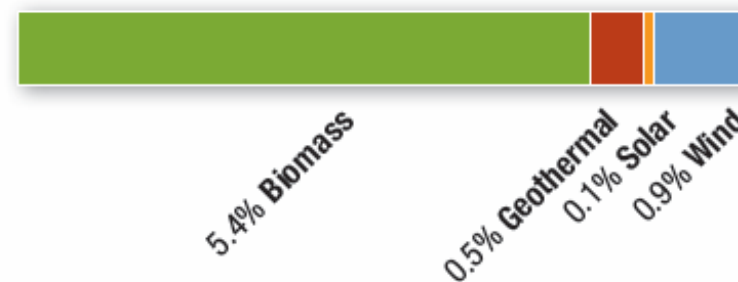
Total: 3.6 billion kWh  
(12.2 Quadrillion BTU delivered from 38.3 primary)

# U.S. Energy Production and Consumption (2009)

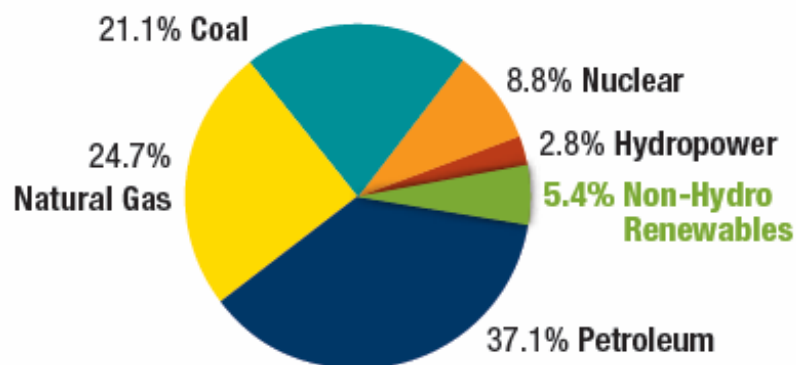
**U.S. Energy Production (2009): 73.5 Quadrillion Btu**



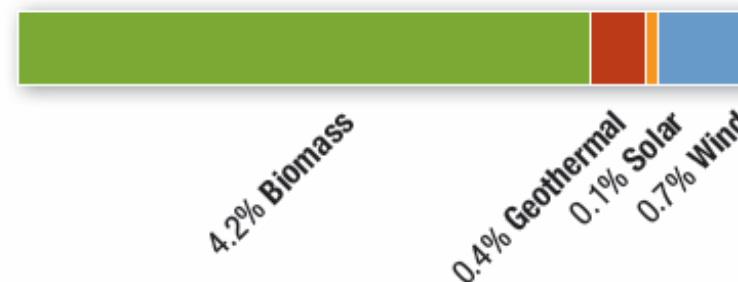
**U.S. Non-Hydro Renewable Energy Production: 5.2 Quadrillion Btu**



**U.S. Energy Consumption (2009): 94.9 Quadrillion Btu**



**U.S. Non-Hydro Renewable Energy Consumption: 5.1 Quadrillion Btu**



Source: EIA

Note: Because hydropower is considered a conventional source of energy, it is accounted for separate from other new renewable sources of energy. Energy consumption is higher than energy production due to oil imports.

# Goals

## Security:

- Advance domestic energy resources.
- Diverse supplies.



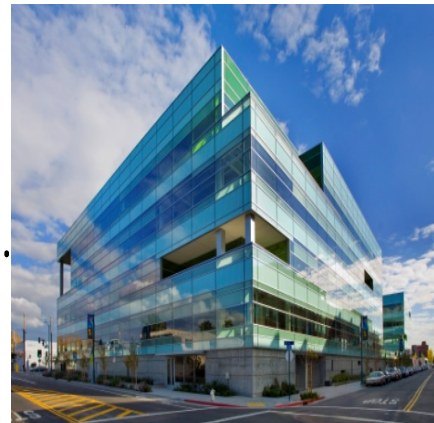
## Environment:

- Achieve 80% reduction in Greenhouse Gas Emissions.
- Improve water and air quality (indoor and outdoor).

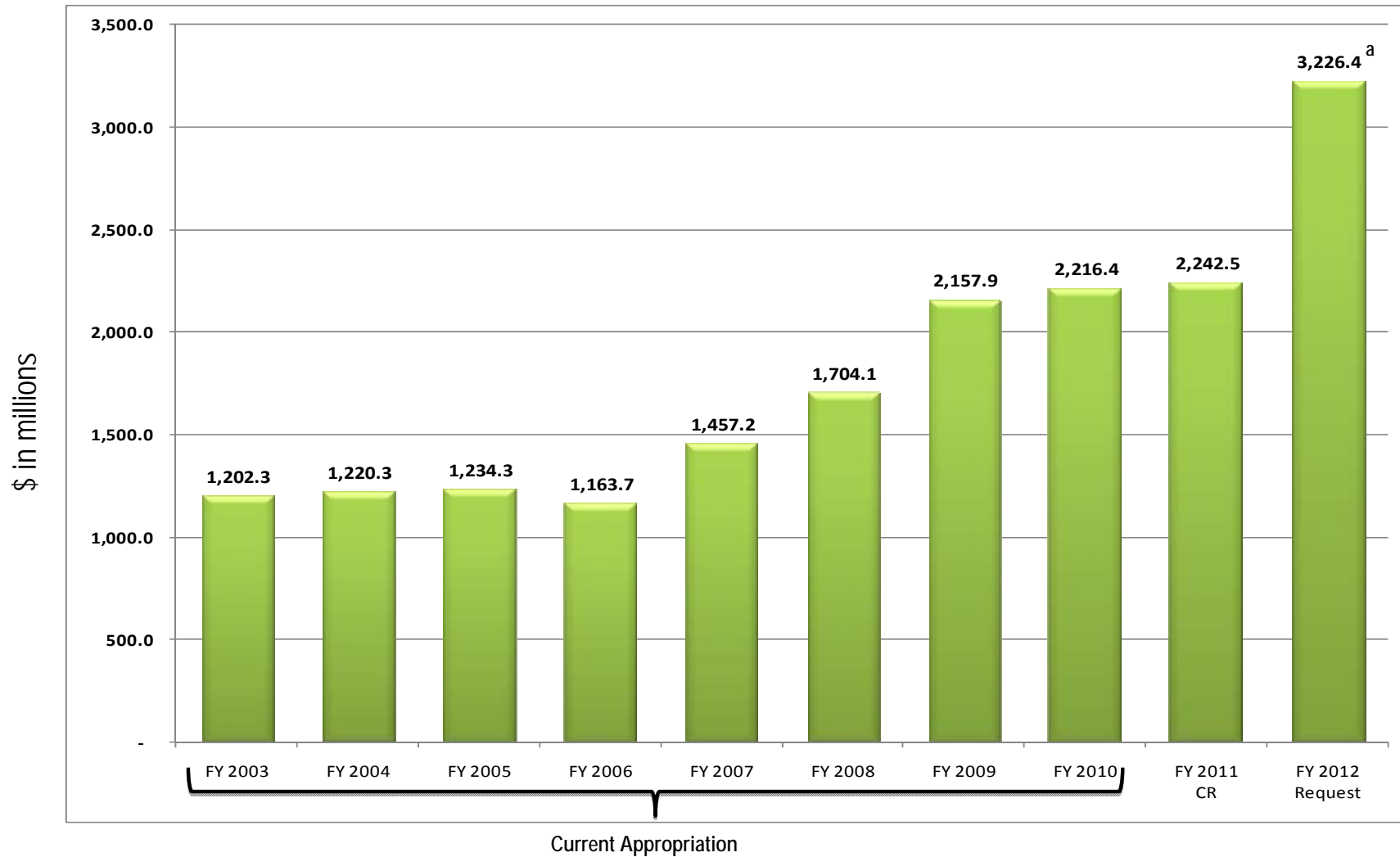


## Economy:

- Low cost energy services.
- Clean energy business opportunities.
- Clean energy jobs.

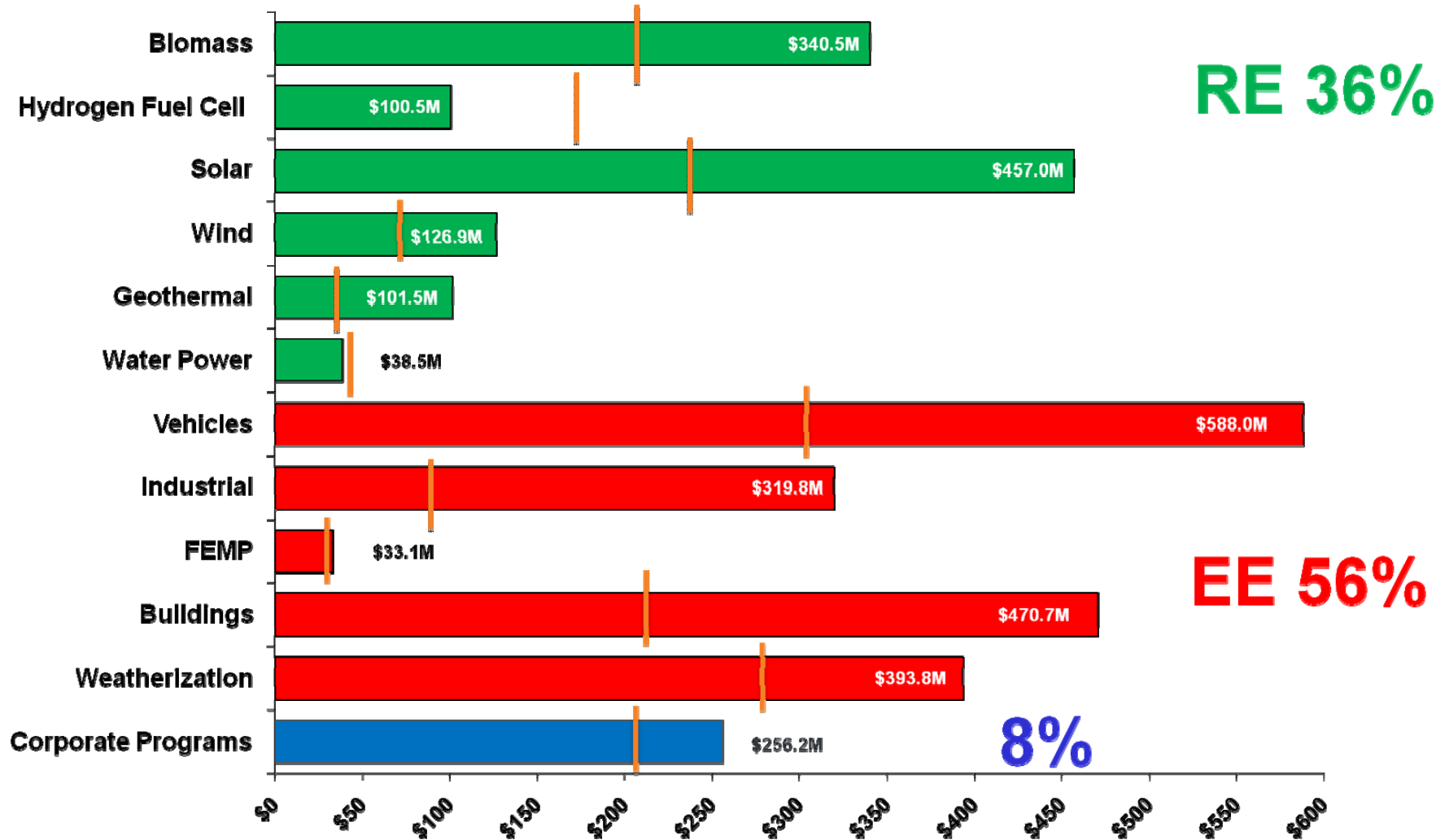


## EERE Budget Trend FY 2003 - 2012



<sup>a</sup> Excludes (\$-26.4M) reduction in Prior Year Balances

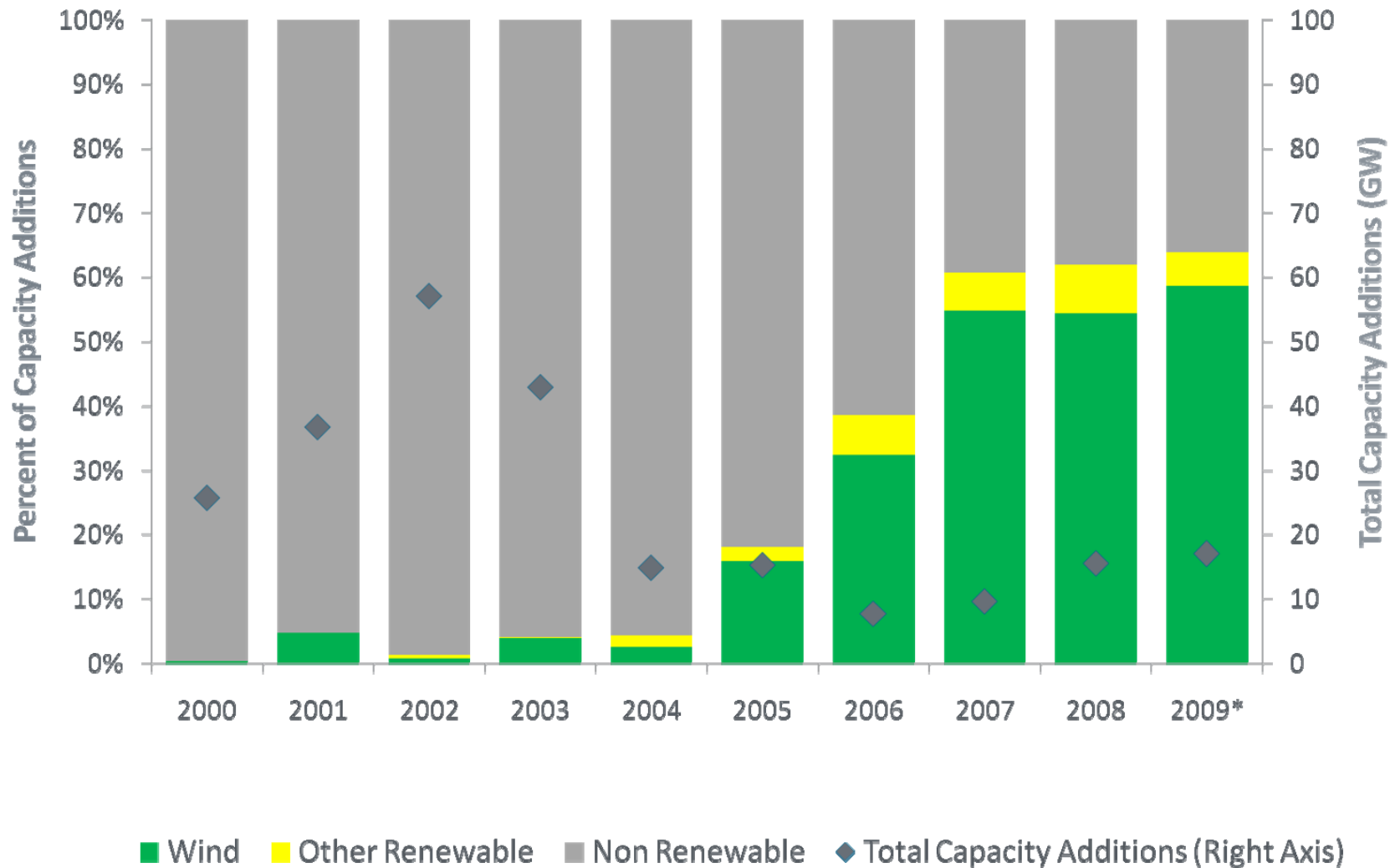
## FY 2012 Budget Request (\$3,226.4M)<sup>a</sup>



<sup>a</sup>Excludes (\$-26.4M) reduction in Prior Year Balances  
 | = FY2010 Current Appropriation

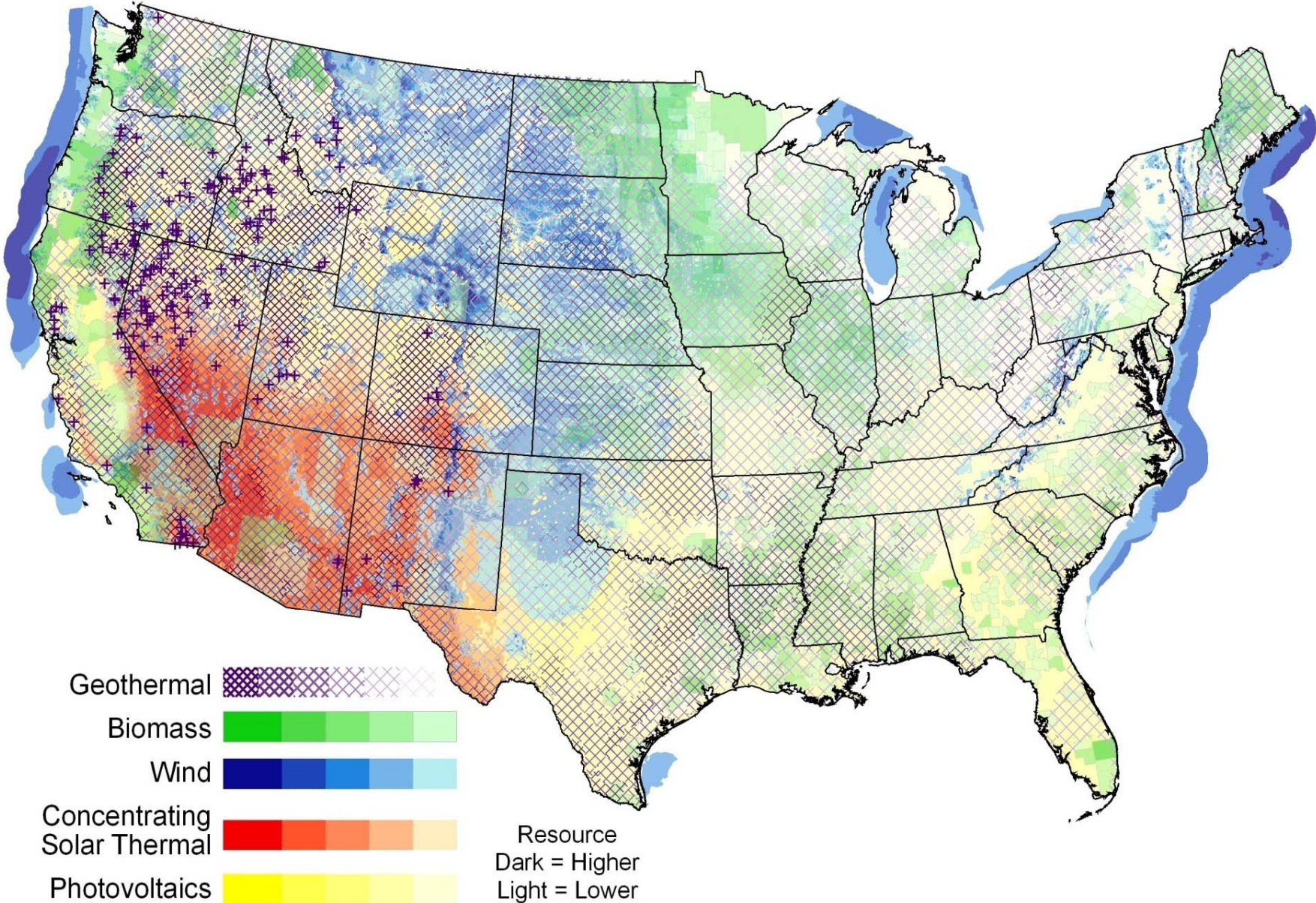
\$ in millions

# New Electricity Capacity – High Growth for Renewables

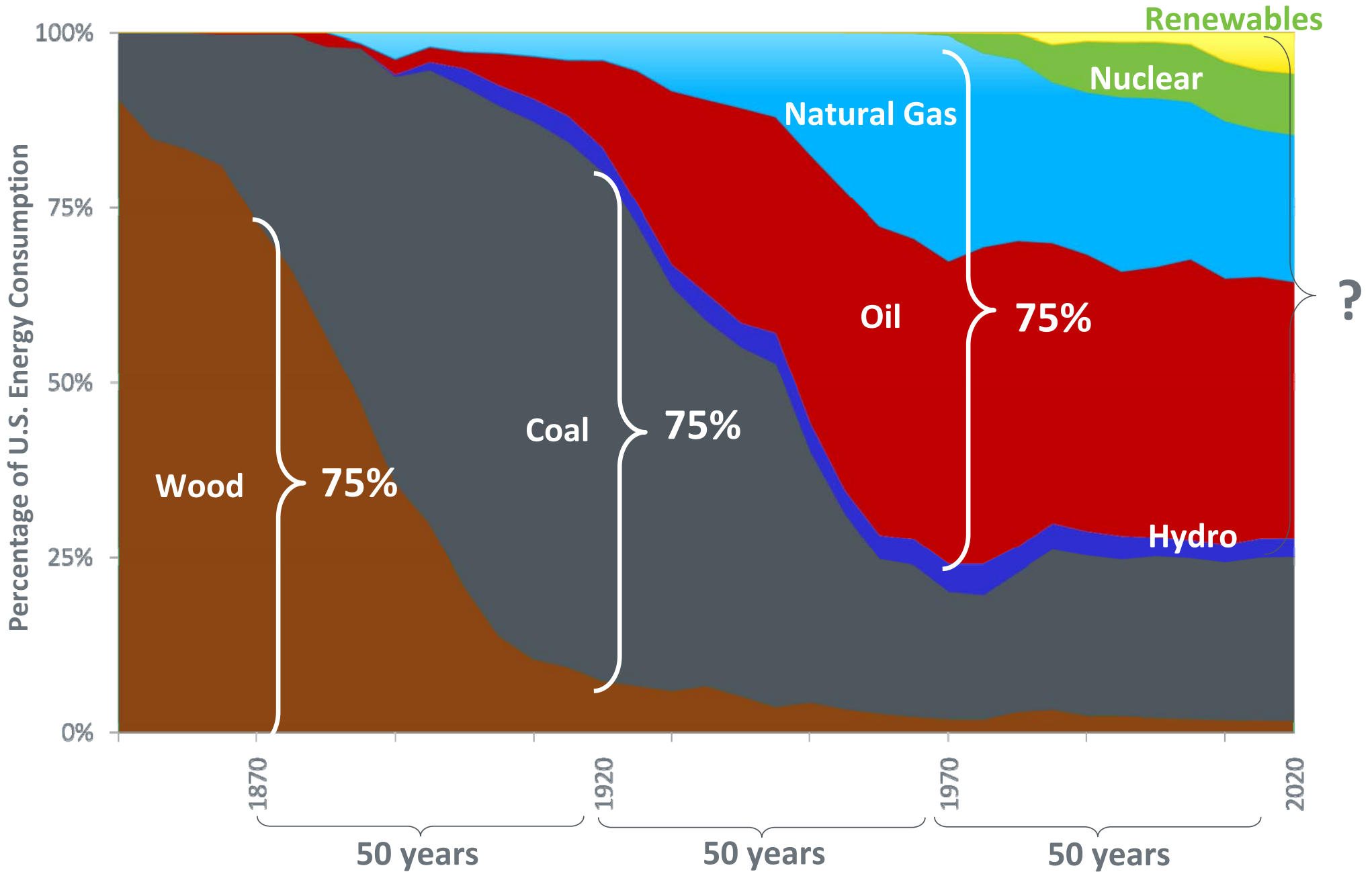




# U.S. Opportunity: Huge Renewable Potential



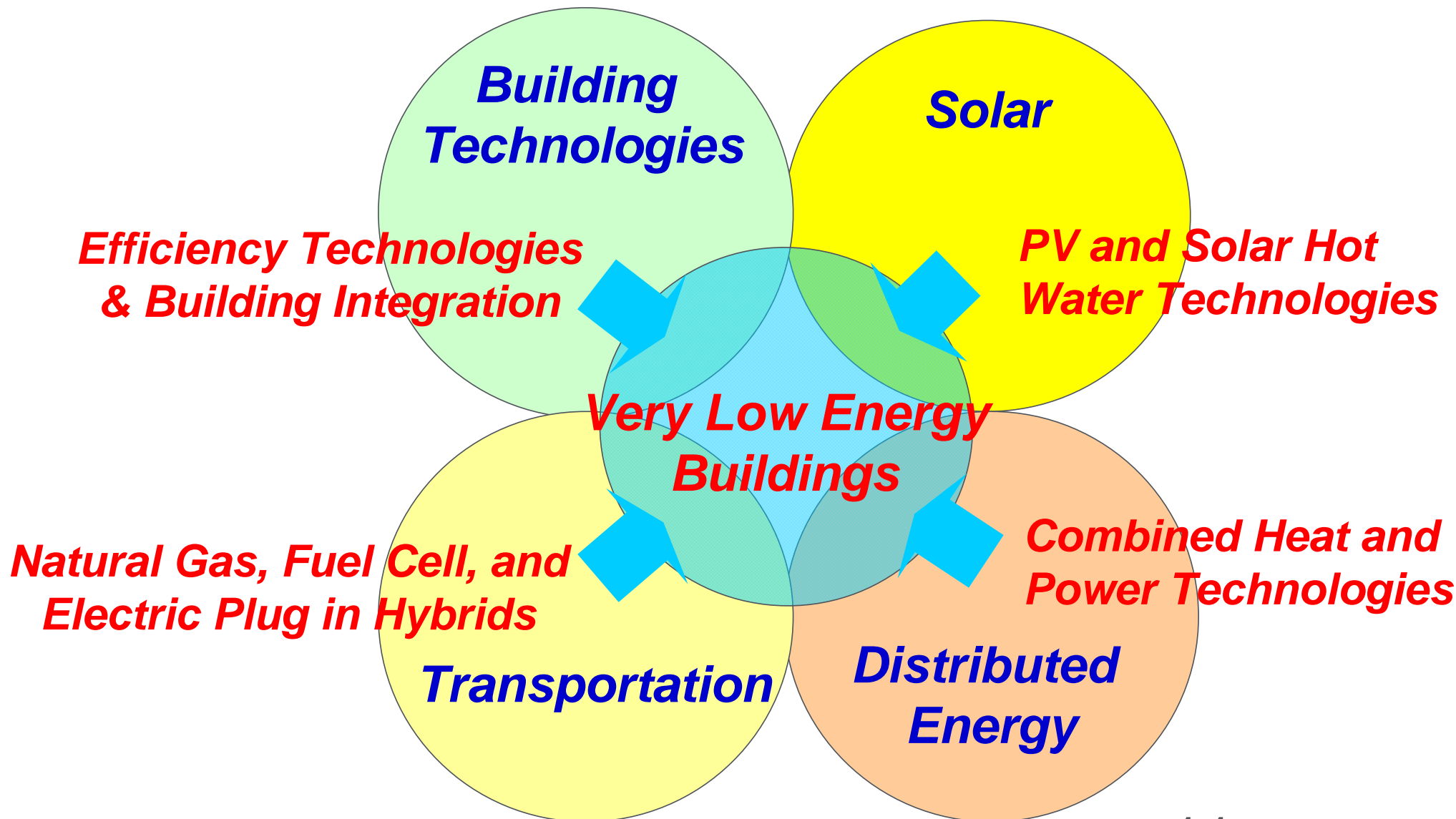
# History of Energy Use



Sources: EIA, *Annual Energy Review: 2008* and EIA, *Annual Energy Outlook: 2009 with Recovery Act Update*

# Buildings as the Integrator

Renewable Energy, Building Technologies, and Transportation become Fully Integrated with Very Low Energy Buildings



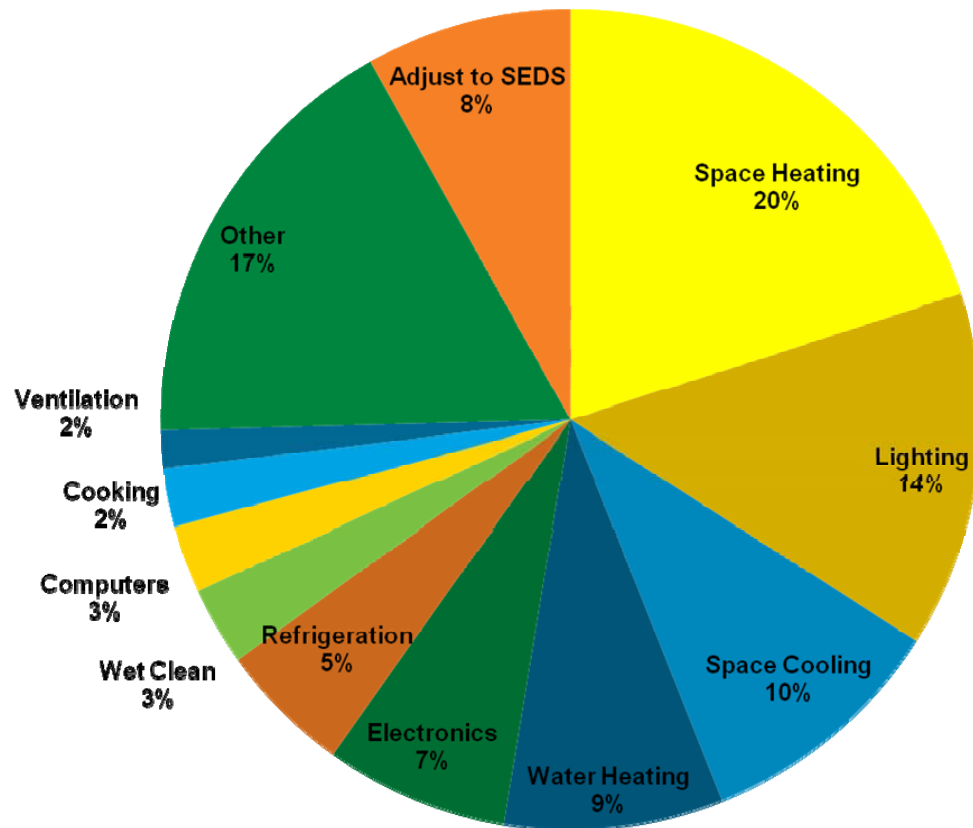
# Electricity Capacity from Buildings for Transportation

Energy efficient appliances, equipment, lighting and advanced envelope save electricity and natural gas to free up capacity for bridging fuels.



# Emerging Technologies » Portfolio

The emerging technologies portfolio addresses high end uses.

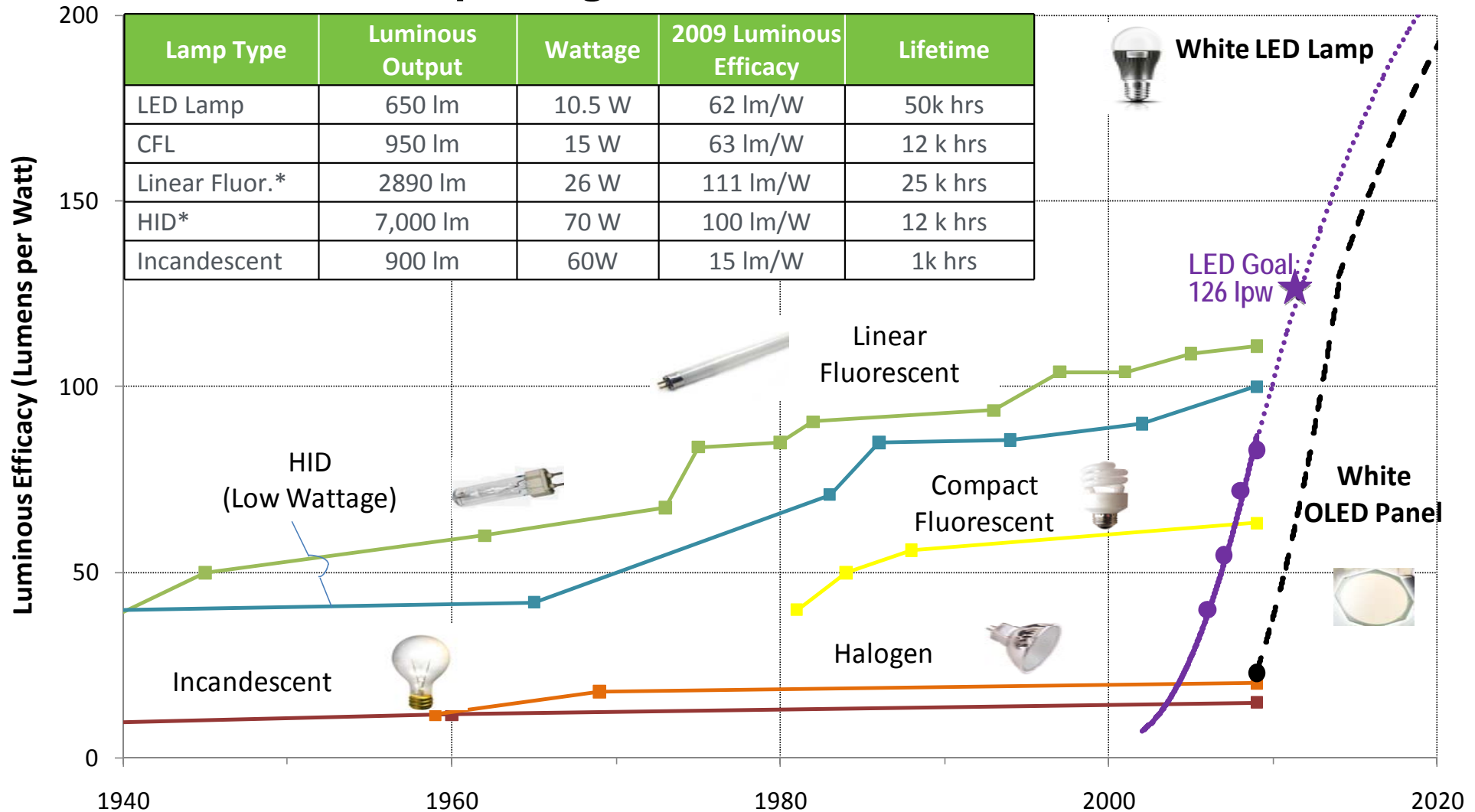


U.S. Buildings Energy by End Use (2010)  
(Source: Building Energy Data Book 2009)

- Solid State Lighting
- Windows and Thermal Envelope (Heating, Cooling and Lighting)
- Advanced Heating and Cooling
  - Solar Heating and Cooling
- Water Heating
- Appliances and Miscellaneous Electric Loads (Refrigeration, Wet Clean, Cooking, Computers and Electronics)
- Analysis Tools
- Sensors and Controls

# Solid State Lighting » Performance Goals

The SSL goal is 126 lumens per Watt by 2012 (with 1,000 total lumen output) and <\$2/klm device package by 2015.

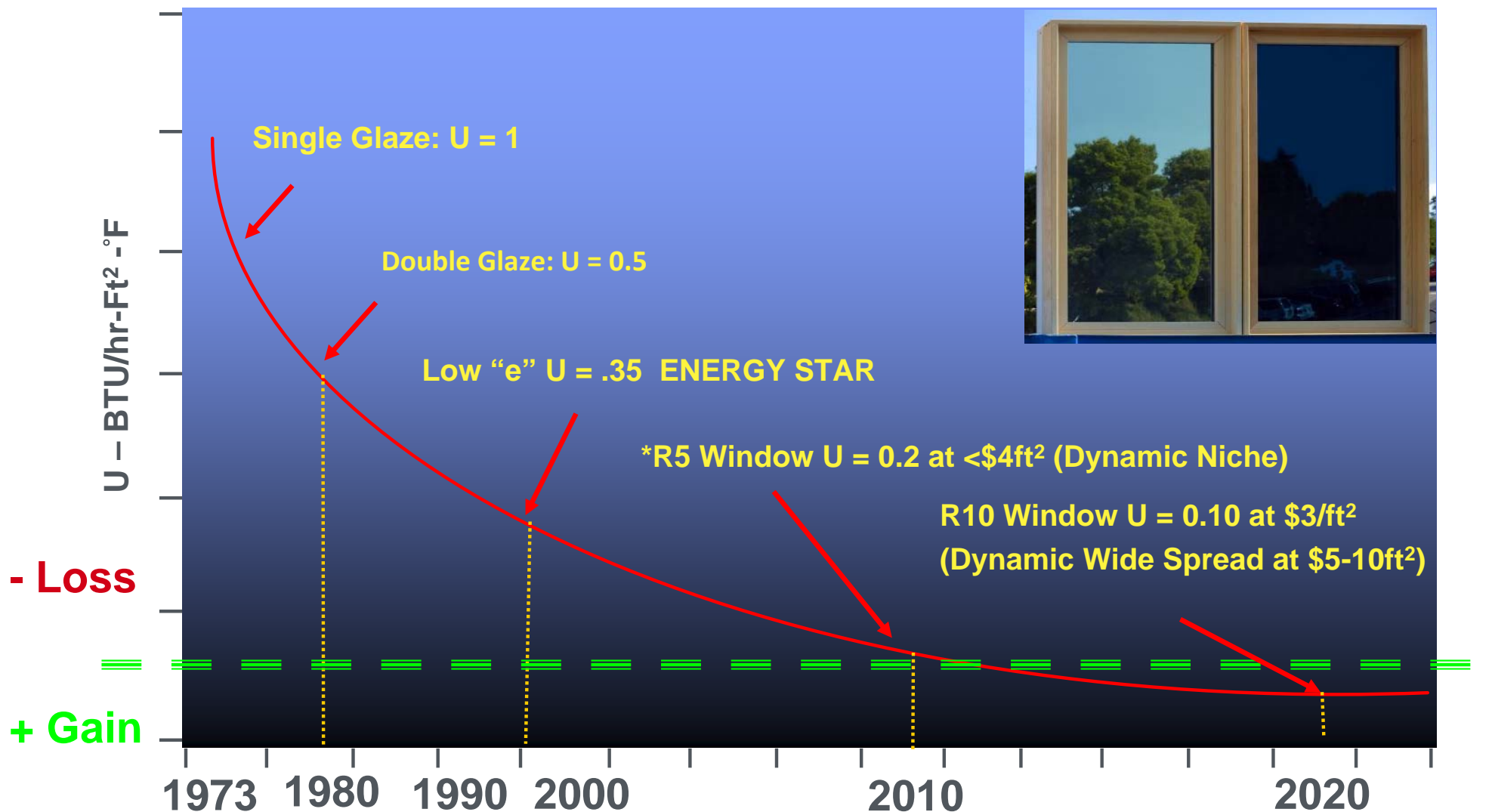


Sources: 2010 Draft Solid State Lighting Multi-Year Program Plan

\*Note: Linear fluorescent and HID luminous efficacies represent only lamp efficacies and not system efficacies.

# Windows » Performance Goals

The Windows goal is highly insulating window (R-10) at a cost premium of \$3/ft<sup>2</sup> by 2020, and dynamic windows at \$5-10/ft<sup>2</sup>.



\*Note: Original goal was R6 since 2003 but high cost of kypton has resulted in R5 performance

# Thermal Envelope

- Advanced walls to reach R20 in 3.5” cavity, R30 total wall exterior insulation systems
- Next Generation of Attic/Roof System to save 50 Percent Energy
- New Material Development
  - 100 R&D Award in 2009 for phase change insulation
  - Higher performing foams and aerogels
  - Dynamic membranes
- Test procedure development and performance impacts in association with industry & standard organizations
- Cool Roofs Research and Deployment
  - Accelerated “aged” protocol leading to ISO standard to support innovation
  - Urban heat island and global studies
  - International infrastructure development leading to US product sales and global demand mitigation (hottest climates without insulation)



**Dynamic Insulation**

**Air Barrier Tests**

**Roof Performance**





# HVAC » R&D Planning Activities

**Other areas, such as HVAC, are following the lead of SSL and Windows and developing cost metrics and roadmaps.**

- Leveraging ARPA-E and ARRA R&D funding for breakthrough technologies
- Expanding scope to Appliances and Miscellaneous Electric Loads (MELs)



## **CRADAs in BTP's HVAC, Water Heating, and Working Fluids R&D:**

- Air-Source & Ground-Source Integrated Heat Pumps (IHP) can provide space conditioning (heating, cooling, dehumidifying, ventilating) and water heating requirements
- Next generation of HPWH using CO<sub>2</sub> as a working fluid
- Absorption Water Heater
- Fuel-Fired Furnaces for Space Heating and Water Heating
- Low Global warming potential (GWP) Refrigerants R&D

# Research Planning » The HUB

**On February 12, 2010, the Obama Administration announced a multi-agency funding opportunity to support an Energy Regional Innovation Cluster (E-RIC).**

- Six Federal agencies are working together to leverage funding and resources to promote regional growth (DOE, DOC/NIST, DOC/EPA, SBA, DOL, DOEd)
- Holistic, systems approach to science and technology and will act as an integrator of basic and applied R&D
- Develop and demonstrate sustainable and efficient models for attaining national strategic objectives
- Multidisciplinary team of researchers to speed R&D and shorten path to technological development and commercial deployment

# Residential and Commercial Integration

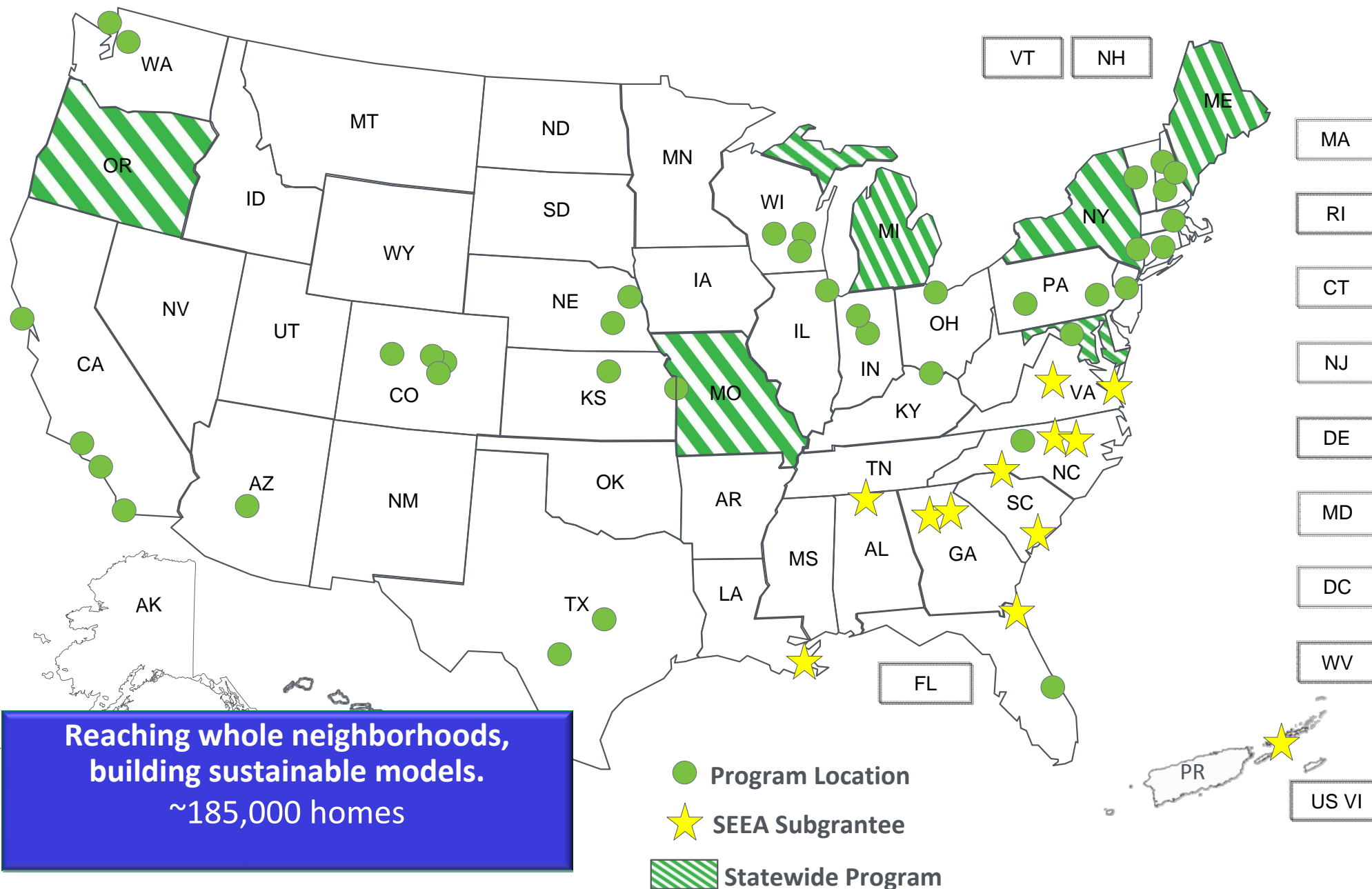
Residential and Commercial Integration are working with the marketplace to achieve aggressive deployment goals

- Building America
- State EE Appliance Rebate Program (ARRA)
- BetterBuildings (ARRA)
- Commercial Building Partnerships
- Clean Energy Ministerial: GSEP & SEAD



\* Does not include all partnerships

# Recovery Act: Investing in Efficiency



**Reaching whole neighborhoods,  
building sustainable models.**  
~185,000 homes

# Building Energy Codes: Goals

## Model Energy Codes

### 30% Initiative for Increased Energy Savings

- 20-30% energy savings in just 3 years using prescriptive approach

### 50% Goal—a challenge

- Need to go beyond prescriptive approaches
  - Exploring performance-based options and alternative paths to compliance
  - IGCC: Submitted outcome *and* performance-based proposals

### 90% Compliance by 2017

- Continue technical and financial support to the states
- Comprehensive adoption and compliance strategy
  - **Goal:** 10 states to adopt the ARRA target codes or more efficient in FY2011

30% Better Codes

Proposed in 2010

50% Better Codes

Proposed by 2015

90% Compliance by 2017

# Accelerating Appliance Standards

New standards (>20 products) since March 2009 will save **\$250 - 300 billion** through 2030

Standards issued in the next 2 years (11 products) could save an *additional* **\$250 – 300 billion**

These new standards will cover **>30% of *all*** energy consuming devices in the residential and commercial sectors



# Building Envelope Has Significant Opportunity in APEC

- Pursuing building material testing and rating centers to allow for investment in high performance building components
  - Supports all major promotion and regulatory policies
  - Creates jobs for host economy installing efficient products
  - Creates jobs for investing economy - equipment and raw material sales
- Analysis is needed to conduct macro APEC quantitative opportunity assessment, builds on window and cool roof projects
- Wide spread technology exists that has not become mainstream, i.e. low e glass, high levels of insulation, radiant barriers, cool roofs, window films, and reflective wall coatings

## Contact Information

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